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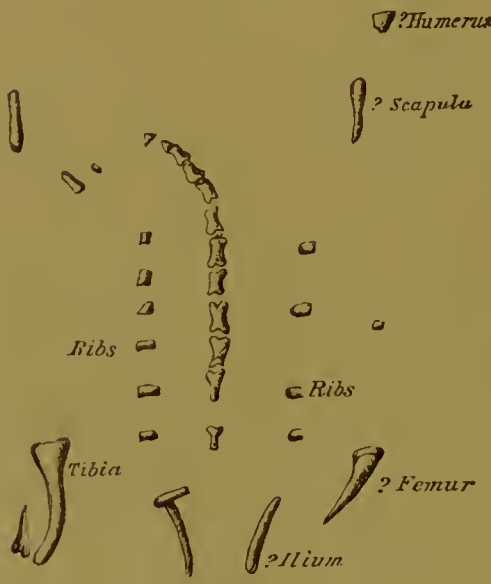
On Hortalotarsus skirtopodus, *a new Saurischian Fossil from Barkly East, Cape Colony.* By H. G. Seeley, F.R.S.*

In the Albany Museum, Grahamstown, are a few remains of a skeleton, known locally as the Bushman Fossil, discovered by Mr. William Horner Wallace at "Eagle's Crag," Barkly East, Cape of Good Hope, 11th June 1888. A sketch of the specimen (fig. 1) was made by Mr. D. Rudlin, of Kelvin Grove, Barkly East, which shows what appear to be the superior

* Read before the Geological Society of London, June 22, 1892, as Part 8 of "Contribution to Knowledge of the Saurischia of Europe and Africa."

margins of the ilia, which are thin and diverge as they extend forward. At the left side, somewhat displaced, is the tibia, curved and wide at the proximal end, and at its distal end a part of the proximal end of the metatarsus is exposed, flexed forwards. On the right side the proximal end of the right tibia or femur is seen. Some distance in front of the pelvis ten or eleven dorsal vertebræ are shown in sequence. They appear to be more slender in front than behind, have the centrum somewhat elongated, concave at the sides, and cupped at the articular ends. At the sides are seen transverse sections of the ribs, from which it would appear that the neural arches had perished, together with the parts of the ribs between the

Fig. 1.



Skeleton of *Hortalotarsus* before it was destroyed by blasting.

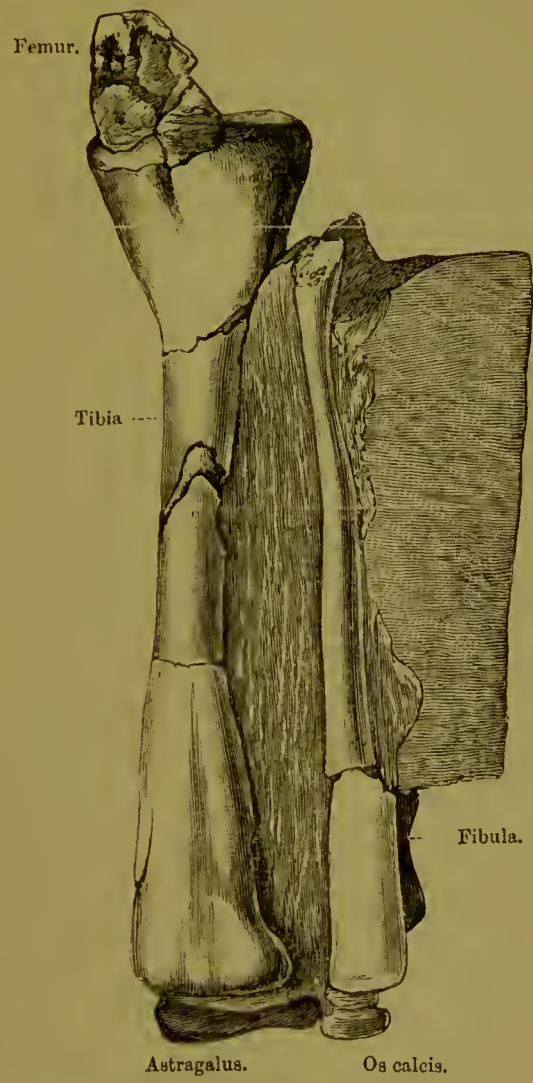
centrums and the sections exposed in the rock. Anteriorly are two bones placed laterally, probably the scapulæ, and on the right side may be an indication of the humerus. An attempt made to remove the block of slate by a charge of gunpowder scattered the pieces so that they were never found, with the exception of a few small fragments. Two of these were entrusted to me; they promised to show characters of the tibia and fibula. Everything which skill could achieve in removing the matrix has been done for me by Mr. Richard Hall, with the result that, although the specimen is imperfect, it makes an important addition to knowledge of the structure of the tarsus * in animals which have been grouped as Dino-

* In Ornithischia the tarsus shows two family types. In Iguanodontia the ascending intermedium impresses the tibia in front. In the

sauria, indicating a new type, which I propose to call *Hortalotarsus skirtopodus*.

At the proximal end of the tibia is the distal inner condyle of the right femur, probably in natural flexed position, for its

Fig. 2.



Posterior aspect of fore leg of *Hortalotarsus*.

flattened inner side appears to have been flush with the inner side of the head of the tibia. Its distal articular surface is

Scelidosauria there is no ascending process impressing the tibia. In the Saurischia the Megalosauria have the distal end of the tibia impressed obliquely or laterally. The condition is the same in the Cetiosauria; but in the Euskelesauria the distal end of the tibia is no more modified than in the Scelidosauria.

well ossified and well rounded from back to front, and concave on the hinder margin in the usual way between the condyles, though the right condyle is not preserved.

The tibia and fibula are in natural association, but the proximal articular end of the fibula is lost, and the proximal end of the tibia is slightly broken. Both bones have large central cavities, like *Palæosaurus* and the allied Triassic reptiles of Europe.

The tibia (fig. 2) is $7\frac{7}{10}$ inches long. The transverse width of its distal end is $1\frac{1}{2}$ inch. The width at the proximal end is $1\frac{1}{10}$ inch as preserved, but may have been slightly more. The antero-posterior measurement at the proximal end is $2\frac{1}{10}$ inches and at the distal end is $\frac{9}{10}$ inch. Thus the two ends of the bone have the aspect of being twisted nearly at right angles to each other, as in many other Dinosaurs. In general form and size the bone resembles *Agrosaurus*, and, in a less degree, *Palæosaurus*.

The proximal articular surface is flat, truncate, slightly inclined backward and slightly inclined outward. It appears to have been subtriangular, wide behind, with a slight notch between the condyloid eminences on the posterior surface. The internal contour of the articulation was rounded from behind forward to the cnemial crest, which is small, rounded in front, and defined by a slight shallow fibular groove placed anteriorly, posterior to which was the large condyle on the external or fibular side.

Seen from the internal aspect the anterior vertical contour of the bone is nearly straight, being very slightly concave; but the posterior contour is concave in its proximal third, owing to the backward extension of the condyles, and then straight almost to the distal end; the bone has an aspect of being compressed from front to back in the lower part of the shaft. If there is an appearance of slight distal expansion, it is due to the way in which the metatarsal bones are crushed upon the tibia in front. On the posterior aspect the shaft contracts above the middle length to about $\frac{6}{10}$ inch. It is well rounded from side to side in the middle, but flatter towards the distal end. Both inner and outer contours are concave in length, but the concavity at the distal end is only marked on the fibular side. This is due partly to crushing and partly to extension of the bone towards the fibula. If there is any notch on the distal fibular border of the tibia it is not exposed. There does not appear to be any notch or groove on the anterior side at the distal end, the condition of the bone in this respect resembling the tibia of *Euskelesaurus*. The absence of the distal notch on the tibia is a distinction from all known allies in the Trias of Europe.

The fibula is parallel to the tibia, and is exposed on its external side. It is well preserved on the posterior aspect. It shows no indication of close contact with the tibia at the distal end. It appears to be slightly curved in length, being bowed outward, so that, although the extremities of the two bones came near together, there is a fusiform interspace between them which is eight or nine tenths of an inch wide in the middle. About $1\frac{1}{4}$ inch of the proximal end of the fibula is lost. The fracture shows the bone to be compressed from side to side, flat on the tibial side, convex externally, $\frac{8}{10}$ inch from front to back and $\frac{1}{2}$ inch from within outward. As the bone extends distally it probably becomes subcylindrical in the middle, and then makes an obliquc twist as it widens to $\frac{7}{10}$ of an inch at the distal end, where the antero-external face is flattened, with the external margin inclined backward, so that the end of the bone is somewhat oblique to the tibia and its inner angle extends above the astragalus. The posterior distal end of the fibula is more convex from side to side. The transverse measurements over the distal ends of tibia and fibula is $2\frac{4}{10}$ inches, which is probably more than the corresponding measurement over their proximal ends, since both bones are compressed in form from side to side proximally and expanded from side to side distally.

The tarsus consists of two rows of bones (fig. 3). The distal row is imperfectly preserved, but the proximal row consists of astragalus, calcaneum, and a small intermedium. I am not aware that the intermedium has previously been observed as a separate ossification in any Saurischian, though Professor E. S. Morse has identified the ascending process of the astragalus with that bone in both Ornithischia and Aves *.

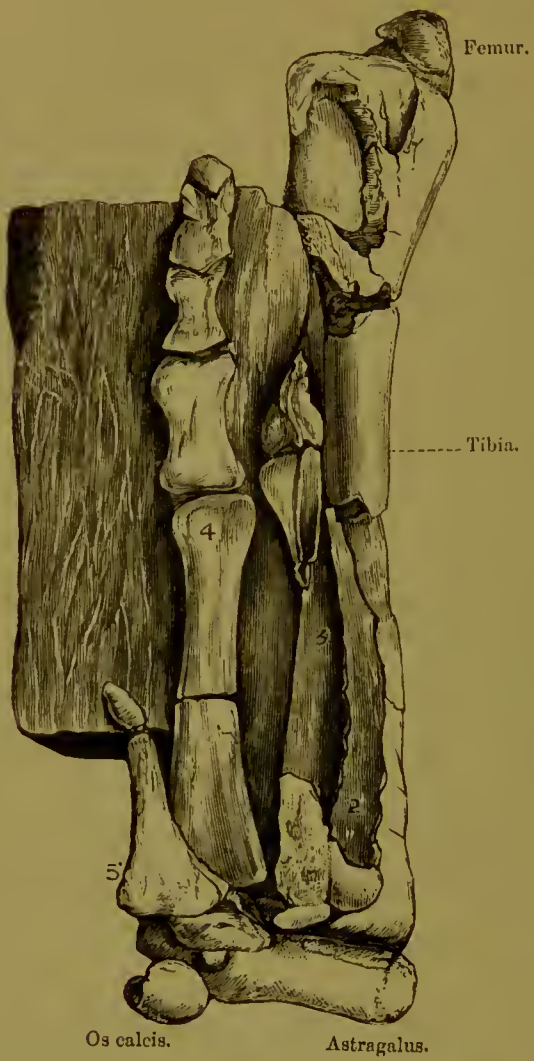
The astragalus is a transversely oblong bone which fits on to the distal end of the tibia, and closely corresponds to it in form, except that it is wider, extending a little beyond its external margin. Its transverse measurement is $1\frac{7}{10}$ inch; it is $\frac{1}{2}$ inch deep in front, but posteriorly the depth is very small, though it thickens a little towards the internal side. The inner side has an antero-posterior measurement of $\frac{9}{10}$ inch; the external border is about two thirds as wide. The anterior margin is slightly concave, the posterior margin slightly convex, and the short sides incline a little backward.

The articular surface is convexly rounded from front to

* E. S. Morse, "On the Identity of the Ascending Process of the Astragalus in Birds with the Intermedium," Anniversary Memoirs of the Boston Society of Natural History, 1880. In that memoir the intermedium is found and figured in embryos of tern, petrel, sea-pigeon, herring-gull, eider-duck, southern black-backed duck, penguin.

back and slightly concave from side to side. There is no anterior ascending process to the astragalus. The bone is not in very close union with the tibia.

Fig. 3.



Anterior aspect of bones of the fore leg and inferior aspect of metatarsal bones 2–5 and phalanges.

The calcaneum is relatively small and fits on to the distal end of the fibula. It is not intimately united to the astragalus, but simply articulated. It is about $\frac{7}{10}$ inch wide and $\frac{6}{10}$ inch deep; it is convexly rounded, especially in front, but the external lateral border is occupied by a ligamentous pit, which contributes to make the transverse measurement on the anterior side less than that on the posterior side.

The intermedium (or naviculare) is a small ossification which lies upon the anterior and superior external margin of the astragalus, appearing in front as a small ovate ossicle beneath the inner angle of the fibula, which may be produced upward as a thin film in the outer part of the suture between the astragalus and tibia.

The separate condition of the astragalus and calcaneum is paralleled in *Ornithotarsus* and many American types. The intermedium is so small that it might be easily overlooked or lost in removing the matrix. It may hereafter be found in Saurischia, in which the tarsal elements remain separate. It is not recognized in *Euskelesaurus*.

While the proximal row of the tarsus is in close contact with the tibia and fibula, the distal tarsal row is in association with the extremities of the metatarsus, upon which the bones of the fore leg are pressed down in close contact. There were probably four bones in the distal tarsal row, the three cuneiform and cuboid; but, if so, the first two cuneiform bones are lost with the metatarsals. The third cuneiform is imperfect and gives attachment to the third metatarsal; and the cuboid, which lies below the calcaneum and part of the astragalus, articulates with the fourth and fifth metatarsals. A vertical division like a suture passes through the middle of the cuboid; but there is no conclusive evidence that it is not a fracture.

In transverse measurement the cuboid is $1\frac{1}{10}$ inch; it is wedge-shaped, narrower on the outer proximal margin ($\frac{3}{10}$ inch) than on the inner side, which is less than $\frac{1}{2}$ inch wide on the proximal surface, which is convex from front to back, concave on the anterior and posterior borders, and rounded at the two extremities. It is fully $\frac{3}{10}$ inch deep; but the distal surface, which is smaller than the proximal, is not exposed.

No trace is preserved of the first digit.

Of the second digit only an impression remains of the proximal half of the metatarsal, with a small portion of its proximal articular surface indicating $2\frac{1}{10}$ inches of the length of the bone, which was flattened on the superior surface.

The third metatarsal is 4 inches long, with the bone preserved at the two extremities. It obliquely underlaps the second metatarsal at the proximal end, is flat on the upper surface, expanded at the distal end, and convex from above downward on the distal articular surface; but the convexity does not extend on to the inferior distal surface. A large ligamentous pit is excavated on the external margin. Only a small part of the proximal phalange of this digit is preserved, which shows its articular surface to be concave from

above downward and somewhat deeper than the distal end of the metatarsal.

The fourth metatarsal is perfect, $3\frac{4}{10}$ inches long, $1\frac{1}{10}$ inch wide at the proximal end, which is compressed from above downward and apparently only half as thick as the corresponding parts of the second and third metatarsals. The bone is flattened on the underside; its sides are concave, so that the width in the lower third diminishes to $\frac{4}{10}$ inch, but widens again at the distal articulation to $\frac{7}{10}$ inch. The distal end also thickens, especially on the inner side. Three entire phalanges are preserved in this digit and a fragment of a fourth. They steadily decrease in length and width. The first is $1\frac{1}{20}$ inch long, transversely truncate proximally, $\frac{13}{20}$ inch wide at both extremities, with the sides concave and the under surface concave and flattened, with the inferior margins of the distal articulation prominent on the under surface. The second phalange is $\frac{8}{10}$ inch long and $\frac{6}{10}$ inch wide, of similar broad depressed aspect to the first phalange, but differing in having the inferior proximal articular margin convex from side to side; a character also seen in the proximal end of the third phalange, which is $\frac{13}{20}$ inch long, $\frac{11}{20}$ inch wide proximally, and narrower distally. On the inner side at the distal ends there are large ligament-pits on the lateral border of these three bones; but the pit is absent on the metatarsal bone. Similar pits probably exist on the more compressed external margins of the phalanges, but are not exposed.

The fifth digit is rudimentary. The fifth metatarsal has its proximal end entirely beneath the fourth metatarsal, except at the inclined external border. It is $\frac{17}{20}$ inch wide, much depressed, $1\frac{6}{10}$ inch long, with the sides concave and converging distally to a width of less than $\frac{3}{10}$ inch. The external border is about $\frac{3}{10}$ inch thick, and obliquely flattened at the proximal end. One phalange was developed, which is an oblong rudiment $\frac{9}{20}$ inch long and $\frac{5}{20}$ inch wide, which has lost its extremity in removing the matrix.

In so far as this foot can be compared it approximates nearest to *Dimodosaurus* *; but the metatarsals are less robust and the phalanges more compressed from above downward; and although the forms of the distal tarsals, especially the cuboid, appear to have something in common, the proximal row of the tarsus is dissimilar. In the preservation of the intermedium as a separate ossification not yet blended with

* Gaudry, 'Fossiles Secondaires,' 1890, p. 219. It may also be compared with the foot of *Anchisaurus polyzelus* (Hitche), figured by O. C. Marsh (Am. Journ. Sci. vol. xliii. pl. xvi., June 1892). See also Quart. Journ. Geol. Soc. vol. xlviii., Proc. p. 191, and Proceedings for June 1892.

the astragalus there is a more embryonic condition than in any known Dinosaur, which is a well-marked generic separation of this type from all known Saurischia, with which the hollow bones and their conformation probably associate it. The embryonic condition of the intermedium may account for the absence of the distal notch in the articular surface of the tibia, which otherwise characterizes the Saurischia. It makes a good distinctive character by which the Euskelesauridæ, to which I refer this fossil, may be distinguished from Megalosaurian allies found in Europe.

I express my thanks to the Committee of the Albany Museum for the opportunity of describing this fossil.